

That which is claimed is :

1. An apparatus for measuring vision characteristics of an optical system, the apparatus comprising:

5 focusing means for focusing an optical beam proximate a posterior surface of the optical system for providing a finite source of secondary radiation on a focal surface, the posterior surface other than the focal surface, which secondary radiation is emitted from the focal surface as a reflected wavefront of radiation that passes through the optical system;

10 directing means for directing the reflected wavefront onto a wavefront analyzer; and

a wavefront analyzer for measuring distortions associated with the reflected wavefront.

15 **2.** The apparatus recited in Claim 1, wherein the focusing means comprises a long-focal-length lens for converging the optical beam through a small angle and focusing the optical beam on the anterior surface.

20 **3.** The apparatus recited in Claim 2, wherein the long-focal-length lens has a focal length of at least one-half meter.

4. The apparatus recited in Claim 1, wherein the focusing means comprises a zoom lens for converging the optical beam through a small angle and varying the focusing of the optical beam onto various anterior surfaces.

25 **5.** The apparatus recited in Claim 1, further comprising a laser for providing the optical beam.

6. The apparatus recited in Claim 1, further comprising the a shutter operable from a closed position to an open position for controlling an amount of optical beam energy delivered to the optical system.

5 **7.** The apparatus recited in Claim 1, wherein the wavefront analyzer comprises:
an opaque plate having an aperture therein for transmitting a portion of the emitted wavefront therethrough; and

a light-sensitive material downstream of and in spaced relation to the opaque plate for receiving the portion of the reflected wavefront projected as a finite image thereon.

10 **8.** The apparatus recited in Claim 7, wherein the aperture comprises an aperture array and wherein the light-sensitive material comprises a CCD array.

15 **9.** The apparatus recited in Claim 8, further comprising a lens carried within each of the plurality of apertures of the aperture array.

10. The apparatus recited in Claim 1, further comprising polarizing means for polarizing the optical beam.

20 **11.** The apparatus recited in Claim 10, further comprising a polarization beamsplitter for reflecting an S-component of the reflected wavefront and for transmitting a P-component of the reflected wavefront as a polarized wavefront therethrough.

25 **12.** The apparatus recited in Claim 1, further comprising a camera positioned for viewing the focal surface.

13. An apparatus for measuring vision characteristics of an eye, the apparatus comprising:

a laser for providing an optical beam;

focusing means for focusing the optical beam behind a retina of the eye for providing a finite source of secondary radiation on the retina of the eye, which secondary radiation is emitted from the retina as a reflected wavefront of radiation that passes outward from the eye;

5 polarizing means placed within a path of the optical beam for transmitting a polarized wavefront therethrough; and

 a wavefront analyzer receiving the polarized wavefront for measuring distortions associated therewith.

10 **14.** The apparatus recited in Claim 13, wherein the focusing means comprises a long-focal-length lens for converging the optical beam through a small angle and focusing the optical beam on the anterior surface.

15. The apparatus recited in Claim 14, wherein the long-focal-length lens has a
15 focal length of approximately one-half meter.

16. The apparatus recited in Claim 13, further comprising the a shutter operable from a closed position to an open position for controlling an amount of optical beam energy delivered to the eye.

20 **17.** The apparatus recited in Claim 13, wherein the wavefront analyzer comprises:

 an opaque plate having an aperture therein for transmitting a portion of the emitted wavefront therethrough; and

25 a light-sensitive material downstream of and in spaced relation to the opaque plate for receiving the portion of the reflected wavefront projected as a finite image thereon.

18. The apparatus recited in Claim 17, wherein the aperture comprises an aperture array and wherein the light-sensitive material comprises a CCD array.

19. The apparatus recited in Claim 18, further comprising a lens carried within each aperture of the aperture array.

20. The apparatus recited in Claim 13, further comprising a fixation target for viewing by a patient whose eye is being measured, the fixation target assuring that a patient whose eye is being measured is looking along a preferred direction.

21. The apparatus recited in Claim 13, further comprising a camera positioned for viewing the focal surface.

22. A method for measuring vision defects of an eye comprising the steps of:
focusing an optical beam anterior of the retina of the eye, but not on the retina, for placing a finite source of secondary radiation on the retina, which secondary radiation is emitted from the retina as a reflected wavefront of radiation that passes through the eye;

projecting the reflected wavefront onto a wavefront analyzer; and
measuring distortions associated with the reflected wavefront.